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Holo-GPC: 3D real-time functionality and experimental demonstrations

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We have invented an efficient phase-only light shaping modality that can simultaneously control the distribution of multiple beams and shaping of these beams individually. It is coined Holo-GPC and extends the capabilities of both GPC and holography. Holo-GPC can be considered as a hybrid combination of holography that can create extended 2D or 3D beam distributions and GPC that forms noise-free sculpting of the individual beams. Our preliminary experimental demonstrations show how Holo-GPC is easily implemented with a phase-only SLM (Hamamatsu Photonics LCoS type). Instead of being limited to simple holographic spots with intensity roll-offs, Holo-GPC makes it possible to have spatially distributed structured beams with well-defined high contrast boundaries and output shaped intensity profiles can provide high precision and contrast in various contemporary applications such as for laser materials processing or parallel two-photon optogenetics.. We have shown experimentally that Holo-GPC can easily switch between laterally shaped beams into more focused spots using a phase-only matched filtering multiplexing. This alternate matched filtering modality, further extends the versatility of Holo-GPC and makes it easier to adopt in 3D holographic setups that require tight focusing.

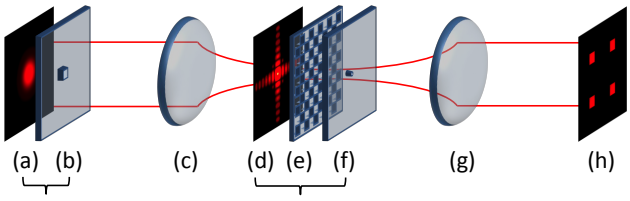

Fig. 2. Holo-GPC configuration adapted from ref. (9)

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